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tuning-fork into the lower prong, near the extremity of which, and upon the interior surface, is a small platinum plate which is touched by the point of a platinum wire. This platinum wire is attached to the end of a short spring. When the current begins to flow, the prongs of the tuning-fork are attracted outwards, the platinum plate is withdrawn from the platinum wire, the flow of the electrical current is interrupted, and the prongs of the tuning-fork are free to spring together again, without the retarding influence of the magnetic poles. The tuning-fork itself, therefore, interrupts the current at each of its vibrations, so as to be subject to an accelerating force of magnetism, when its prongs are moving *outwardly*, without a corresponding retarding action, when they are moving *inwardly*.

The vibrations of this tuning-fork are so energetic, and the amplitude of its excursions is so large, that the ends of the prongs often strike the poles of the electro-magnet. The tuning-fork easily commands the motion of a stout cord, thirty or forty feet in length, which vibrates as a whole, or in segments, whenever the tension is such as to make any one of the harmonics of the cord correspond to the note of the tuning-fork. The middle of the segments sweeps through a breadth of two or three inches, and the eye easily recognizes the nodes, and other peculiarities of vibrating cords, even when the rate of vibration is too slow to produce any acoustic effect. In this way, all the laws of vibrating strings may be illustrated to the coarsest eye even more satisfactorily than is possible with the most highly educated ear."

Five hundred and ninety-ninth Meeting.

September 8, 1868. — ADJOURNED STATUTE MEETING.

The RECORDING SECRETARY in the chair.

Professor Lovering made the following communication on the Periodicity of the Aurora Borealis: —

As this paper will appear in full in the Memoirs of the Academy, over three hundred pages of which are already printed, only a brief abstract will be given in this place. I was incited to the study of the laws of periodicity of the aurora by the absence of any recorded appearances of this display, in this country, before the early part of the eighteenth century, — a failure in the record which could not easily be explained except by a failure in the phenomenon itself, especially when it is considered that the early settlers of New England were not likely to have overlooked appearances which they could so readily associate with the religious or political events of their heaven-determined destiny. A preliminary discussion of the subject was first published in the American Almanac for 1860, and afterwards, with some modification, in the Memoirs of the Academy, Vol. IX. p. 101. But I was soon satisfied that no satisfactory solution of a vast problem could be reached, which was built on anything less than the richest materials that could be gathered from the records of science. Much time has been expended, therefore, in preparing and printing a complete catalogue of all the auroras observed from the earliest times down to the present year, — a catalogue which comprises about ten thousand independent auroras and fifty thousand observations.

The discussion of these materials, so far as it has yet progressed, relates especially to the distribution of auroras between the different days and months of the year, and the accuracy with which this distribution may be expressed by a periodical function. The subject is considered, not only for the whole earth, but also separately for the two hemispheres, and for each place where a series of observations has continued long enough to justify a distinct discussion. The number of auroras occurring in different seasons of the year has been computed by the following formula: —

$$N = A + C_1 \sin. 2\pi (t + c_1) + C_2 \sin. 4\pi (t + c_2) + C_3 \sin. 6\pi (t + c_3);$$

and the result compared with the observations. The mean probable error has been obtained by the usual rule, applied to the differences between the number of observed and computed auroras. The formula just mentioned is the same as I employed in 1845 in discussing the daily changes of temperature and magnetic declination at Cambridge, Mass.* In 1843, Eklöf published † at Helsingfors, Russia, a mathematical investigation of the yearly march of auroral phenomena, in which he employed the same periodic function as I have adopted. Copies, however, of the Scientific Transactions, in which Eklöf published his labors, are very rare in this country. I only know of the single one which I had recently an opportunity to examine, in the Astor Library of New York. As Eklöf confined his inquiry to a few places, and to small and imperfect catalogues of auroras, what I have added to his work may not, perhaps, be superfluous.

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* Memoirs of the American Academy of Arts and Sciences. III. 44.

† Acta Soc. Sci. Fennic., etc. II. 302.

I have taken notice, in my memoir, of the attempts made by Mairan, Ritter, Höslin, Quetelet, Wartmann, Boué, Baumhauer, Wolf, A. de la Rive, Fritz, and Littrow to establish relations between the periods of auroral maxima and minima, and those of shooting-stars, meteors, earthquakes, disturbances in the earth's magnetism, or the sun's inflamed surface, and even the larger nutation-period of the earth's axis, to say nothing of hail-storms, snow-storms, lunar halos, winds, etc.

Since the first two hundred and forty pages of my Memoir on the Periodicity of the Aurora have been printed, General Lefroy, formerly director of the Magnetic Observatory in Toronto, Canada, has put at my disposal his large accumulation of observations in British America; also Professor Joseph Henry, Secretary of the Smithsonian Institution, has placed in my hands the unpublished records of meteorology made in various parts of the United States, under the auspices of this institution, in accordance with the comprehensive plan of its accomplished Secretary. Mr. Charles A. Schott has obtained for me, from the original records in possession of the Smithsonian Institution, the dates of one hundred and eight auroras observed by the late Professor Parker Cleaveland, at Brunswick, Maine. During a recent visit to Leyden, I have been able to consult the manuscript records of Musschenbroek. From these I have gathered the observations made in Holland on four hundred and sixty-seven auroras, most of which have never been published before. With these new and rich materials, and others not specified, to which I have had access since my first catalogue was printed, I have been induced to pause in the midst of my discussion of the *secular* periodicity of the aurora, and print supplementary catalogues. I therefore postpone any remarks on this point until the investigation is brought to a conclusion. The sum total of all the independent auroras contained in all my catalogues amounts to eleven thousand nine hundred and fifty-eight. However, the additional observations contained in the second catalogue, embracing, as they do, but a short period of years, will have less influence upon the question of the secular periodicity of the aurora than upon its yearly march from month to month, at Toronto, Quebec, Newfoundland, etc.; for which the observations in the first catalogue were limited to a small number of years.

Number of Auroras observed each Month in the Western Hemisphere.

Place.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Newfoundland,	9	20	14	16	11	5	13	13	16	19	5	10	151
Quebec,	6	25	14	24	7	10	13	10	19	21	13	7	169
London, Canada,	7	12	12	16	6	5	10	8	10	13	3	5	107
Toronto,	21	37	34	46	35	24	31	25	33	43	34	26	389
Jakobshavn,	27	24	17	1	0	0	0	0	17	28	34	37	185
Gothaab,	61	60	50	21	0	0	0	5	53	45	71	64	430
New York State,	76	89	110	132	89	80	106	125	141	117	75	65	1205
New Haven,	63	59	72	67	62	46	72	66	97	62	86	61	813
Newberry,	23	34	28	30	6	2	3	11	32	30	10	9	218
Providence,	15	17	14	13	18	7	10	7	21	21	14	3	160
Burlington,	8	6	9	8	12	5	6	3	8	3	3	3	74
St. Martin,	6	9	7	9	9	4	14	6	14	3	2	6	89
Wilmington,	6	1	4	1	5	5	6	5	10	3	3	4	53
Worcester,	19	13	27	25	10	9	12	19	30	22	15	11	212
Salem,	9	14	18	17	15	15	30	17	21	22	12	8	198
Boston,	2	4	1	5	1	2	2	1	6	2	6	4	36
Cambridge,	19	27	37	39	21	10	29	20	45	33	17	19	316
Cambridge,	17	31	46	33	24	26	44	40	49	32	31	17	390
Aggregates,	394	482	514	503	331	255	401	381	622	519	434	359	5195

Number of Auroras observed each Month in the Eastern Hemisphere.

Place.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Prague,	6	4	4	6	6	1	2	3	4	7	3	1	47
Ratisbon,	1	3	9	9	6	7	2	4	2	8	3	0	54
Holland,	49	47	92	103	110	34	37	59	64	74	47	34	750
Copenhagen,	1	5	9	12	4	0	3	1	4	5	2	2	48
Mannheim,	18	12	33	32	13	8	12	16	28	18	16	10	216
Scandinavia,	40	30	38	11	0	0	0	4	28	49	47	41	288
Sagan,	25	14	34	40	8	2	3	8	22	39	31	14	240
Spydberg,	8	7	17	6	2	0	0	1	10	18	6	6	81
Italy,	4	9	21	5	3	4	6	7	7	12	3	7	88
Wittemberg,	8	12	13	7	3	0	2	11	8	16	5	6	91
Franeker,	20	15	41	23	16	6	8	15	30	30	13	14	231
Montmorenci,	8	13	26	18	14	6	9	11	27	20	11	5	168
Carlsruhe,	2	9	13	15	8	2	5	11	6	8	5	3	87
Paris,	4	5	12	4	20	5	6	10	15	11	12	4	108
Berlin,	21	37	55	48	39	2	10	10	22	45	29	13	331
Upsal,	85	131	152	75	7	2	4	72	126	146	109	109	1018
Brussels,	12	13	18	22	38	23	23	11	16	23	17	15	231
St. Petersburg,	70	100	179	152	42	13	15	62	145	146	83	79	1086
Stockholm,	27	34	50	56	13	0	0	19	44	39	34	25	341
Christiania,	46	61	75	60	3	0	1	35	78	65	55	55	534
Dunse,	33	20	18	18	3	0	2	14	43	34	30	23	238
Makerstoun,	22	26	28	16	6	0	0	7	16	29	23	11	184
Plymouth, Engl.,	8	7	23	12	6	1	8	8	10	15	13	9	120
Great Britain,	21	19	23	12	3	2	1	3	35	23	21	22	185
Kendall, etc.,	18	18	26	32	21	5	2	21	23	36	38	10	250
Hammerfest,	19	16	8	0	0	0	0	0	4	9	16	19	91
Abo, etc.,	66	87	99	61	9	0	2	28	98	97	74	61	682
Jena,	2	9	4	10	4	2	4	8	14	15	6	6	84
Aggregates,	644	763	1120	865	407	125	167	459	929	1037	752	604	7872

Mr. Oliver made a communication on certain ray-numbers in *Compositæ.*

Professor Cooke described a new species of Muscovite Mica containing Lithium and a trace of Rubidium, associated with the Spodumene of Sterling, Mass.

Six hundredth Meeting.

October 13, 1868. — MONTHLY MEETING.

The CORRESPONDING SECRETARY in the chair.

The Corresponding Secretary read letters relative to exchanges; also letters from Dr. H. L. Mansel and Professor Bluntschli in acknowledgment of their election as Foreign Honorary Members, and a letter from Mr. Samuel H. Scudder in acknowledgment of his election as a Resident Fellow.

Professor F. H. Storer presented the following communication: —

On the Simultaneous Occurrence of a Soluble Lead Salt and free Sulphuric Acid in Sherry Wine; with Observations on the Solvent Action of Alcoholic Saline Solutions upon Sulphate of Lead.

Several years since, I was called upon by a wine-merchant of this city to examine a sample of pale sherry taken from a cask which had been returned to him, on the certificate of a chemist that the wine contained lead. The sample in question was perfectly transparent and clear. There was nothing in the appearance or taste of the wine to indicate the sophistication to which it had really been subjected.

On submitting this sherry to chemical analysis, I found not only that it held in solution a considerable proportion of lead, but also a decided trace of free sulphuric acid, besides an abundance of the same acid combined with some alkaline base. When a portion of the wine was evaporated in contact with slips of paper, the latter soon became crumbly and friable.

Regarded merely from the chemical point of view, without reference to its manifest bearing upon questions of hygiene and jurisprudence, the simultaneous occurrence of a lead salt and of free sulphuric acid in